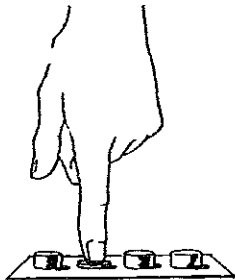




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AUTOMATICALLY**

## relay magic

### FOREWORD

Relay Magic is one of a series of pocket books prepared by the Industrial Products Division of Automatic Electric. The booklets are designed to provide useful engineering information in a handy form. Others include Relay Terms, Basic Circuits, Conversion Factors, and Tables & Formulae.

We recommend that the information in this book be used only as a guide to determine the availability of a circuit and its components. Remember, even the best and most time-proven circuit may fail because of the wrong choice of equipment. For this reason we make no attempt to define specific electrical parameters or component values.

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








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	POSITIVE (GROUND) (D. C.)
	NEGATIVE (BATTERY) (D. C.)
	QUICK-ACTING RELAY COIL
	CONCENTRIC DOUBLE WOUND RELAY COIL
	SLOW-OPERATE RELAY COIL
	SLOW-RELEASE RELAY COIL
	DENOTES "IN" TERMINAL
	STEPPING SWITCH COIL (MOTOR-MAGNET)
INT. 	STEPPING SWITCH INTERRUPTER CONTACTS
O.N.S. 	STEPPING SWITCH OFF NORMAL CONTACTS (SHOWN IN HOME POSITION)

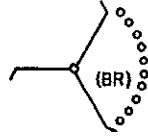
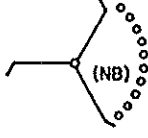

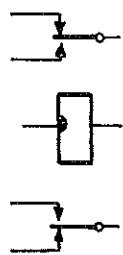
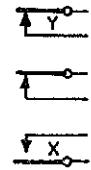
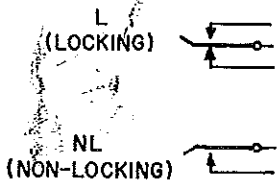

	STEPPING SWITCH BANK LEVEL (BRIDGING)
	STEPPING SWITCH BANK LEVEL (NON-BRIDGING)
	VARISTOR (FOR CONTACT PROTECTION)
	CONTACTS IN A VERTICAL LINE WITH A COIL ARE ACTUATED BY THAT COIL. LEVER SPRINGS MOVE TOWARD THE ACTUATING COIL
	CONTACTS MARKED "X" OPERATE FIRST "Y" CONTACTS OPERATE LAST
	TELEPHONE-TYPE LEVER KEY
	

Fig. 1. Symbols, abbreviations and drawing practices.

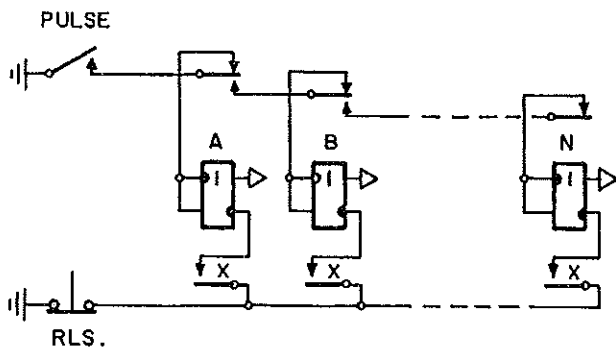


Fig. 2. Counting chain, one relay per step.

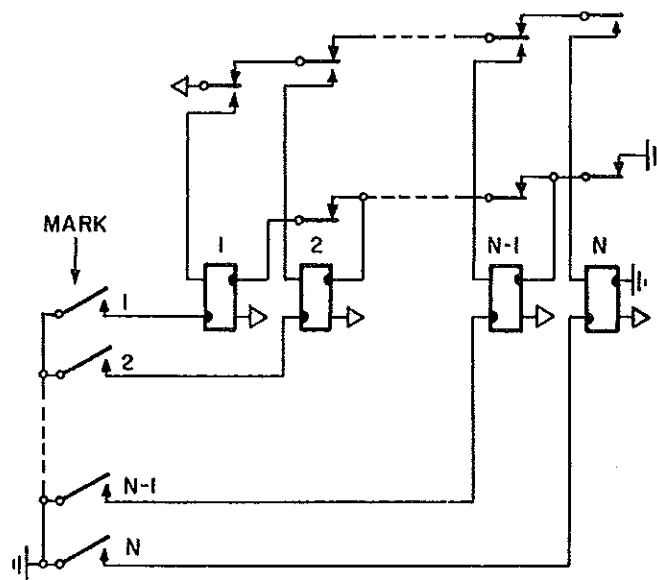
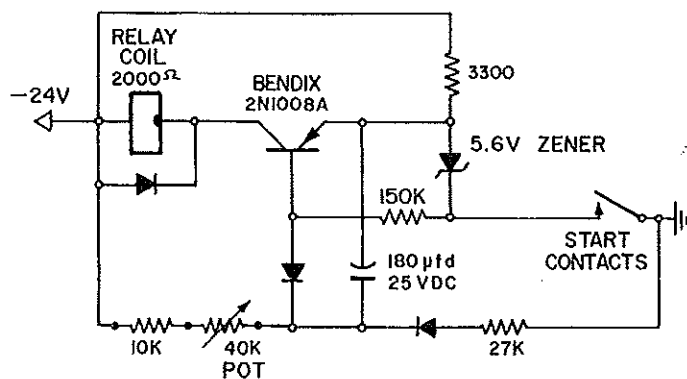


Fig. 4. Random or "jump" finder.



OPERATE DELAY ADJUSTABLE FROM  
QUICK ACTING TO APPROX. 10 SECS.  
TEMP. COMP. - 0° - 100° F

Fig. 3. Zener-stabilized slow-operate relay.

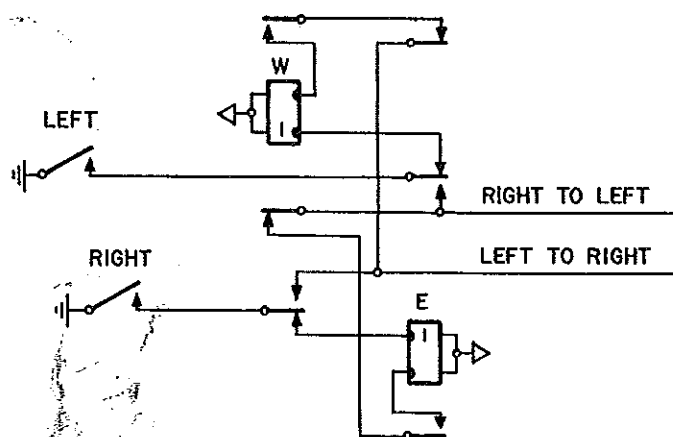
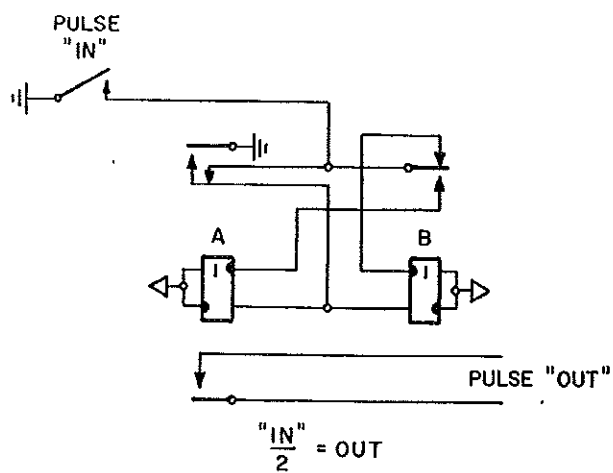
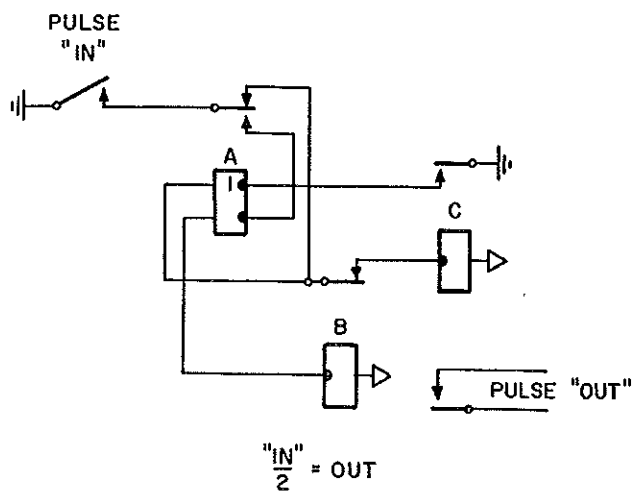


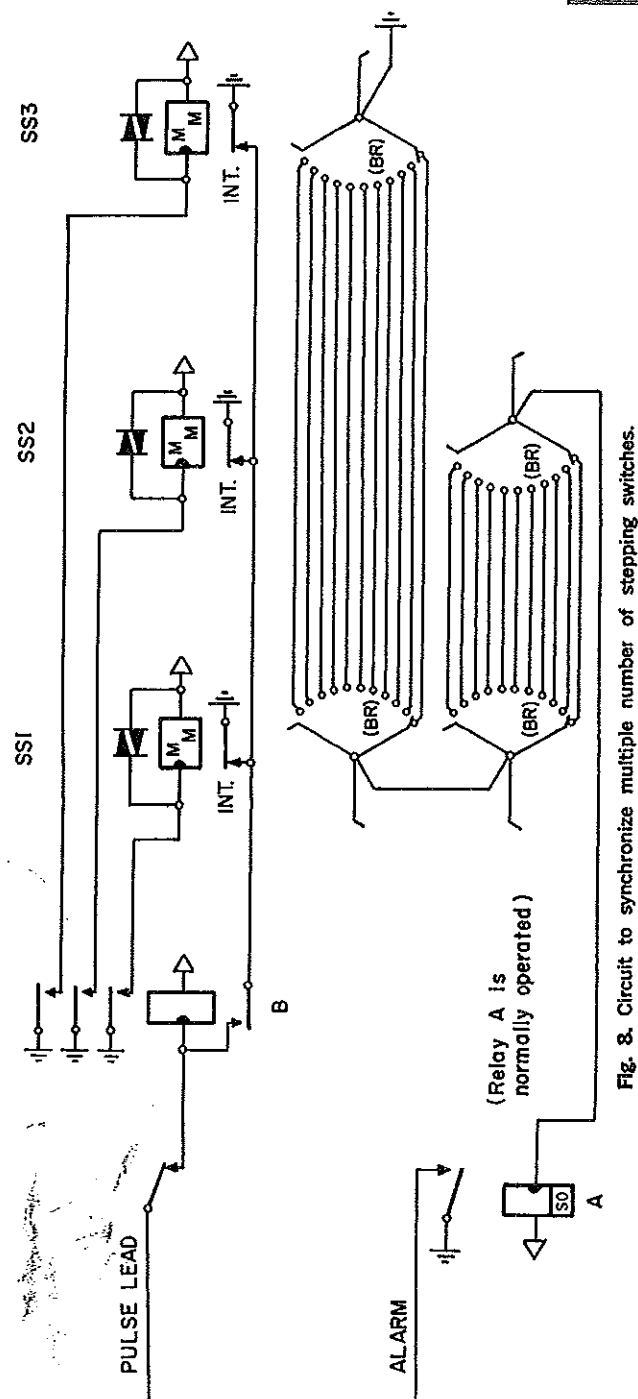
Fig. 5. Direction of phase marker.



**Fig. 6. Pulse divider (2-relay).**



**Fig. 7. Pulse divider (3-relay).**



**Fig. 3. Circuit to synchronize multiple number of stepping switches.**

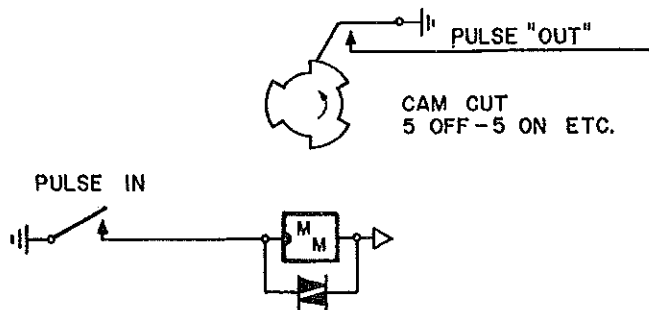


Fig. 9. 30-point OCS Relay used as a 5-to-1 divider.

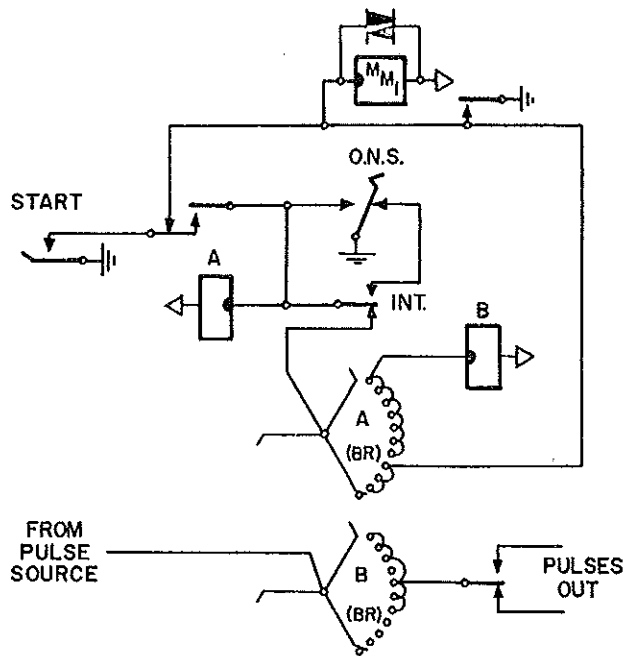


Fig. 10. Code sender or pulse multiplier. (Characteristics of "B" control the pulse frequency and % make.)

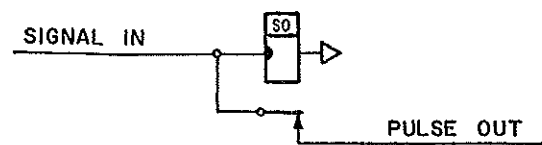


Fig. 11. Pulse shortener.

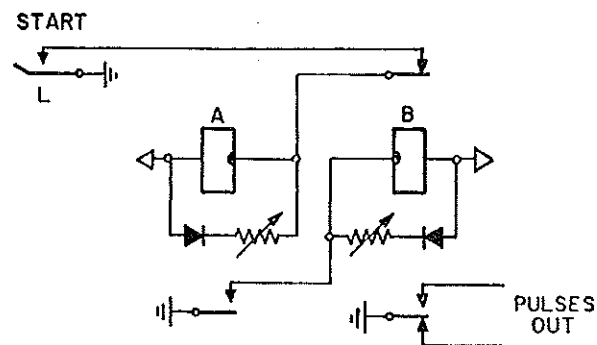


Fig. 12. Simple variable-pulse generator.

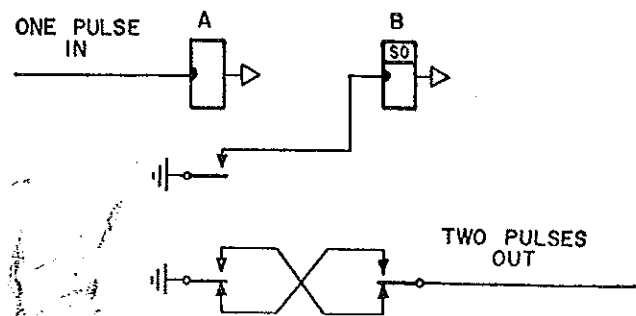


Fig. 13. Pulse doubler. (Relay "B" is slow to operate and slow to release.)



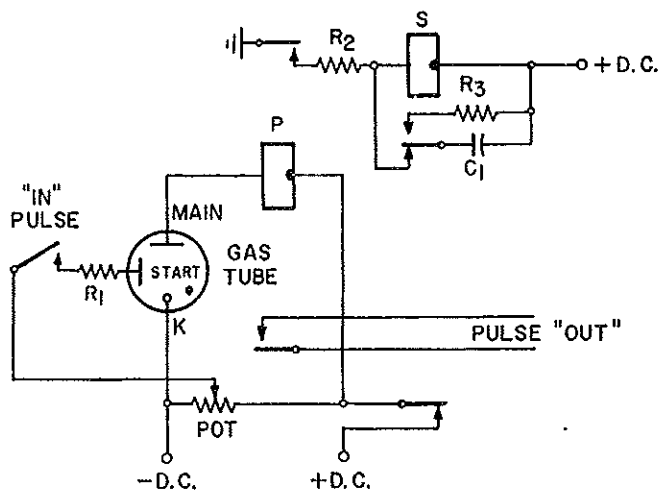


Fig. 14. Gas-tube pulse stretcher

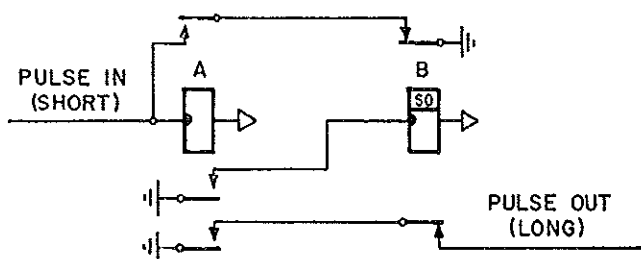


Fig. 15. Pulse stretcher (2-relay).

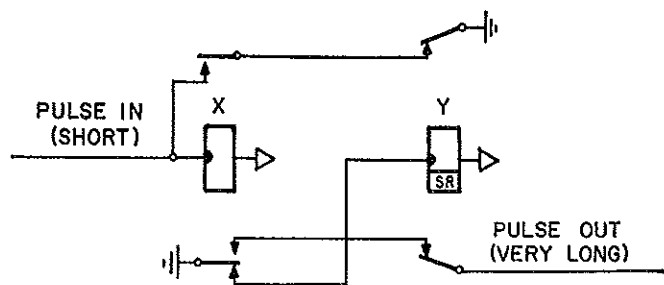


Fig. 16. Pulse stretcher (2-relay).

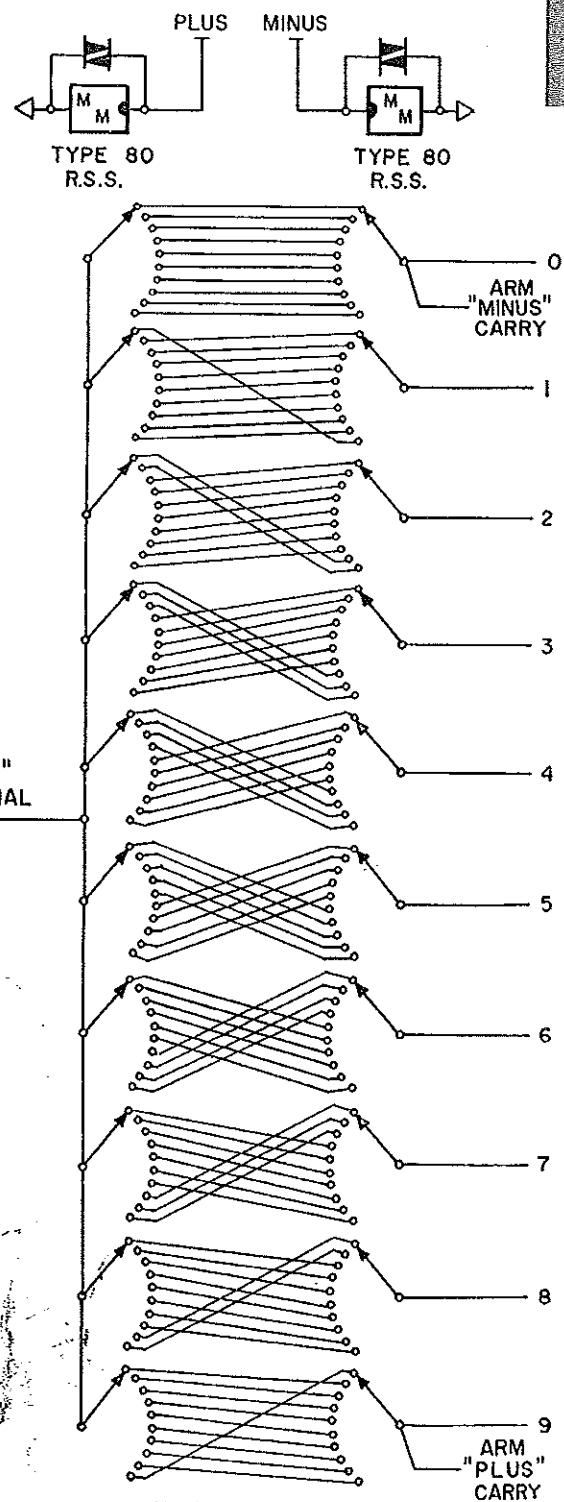


Fig. 17. Bi-directional decade.

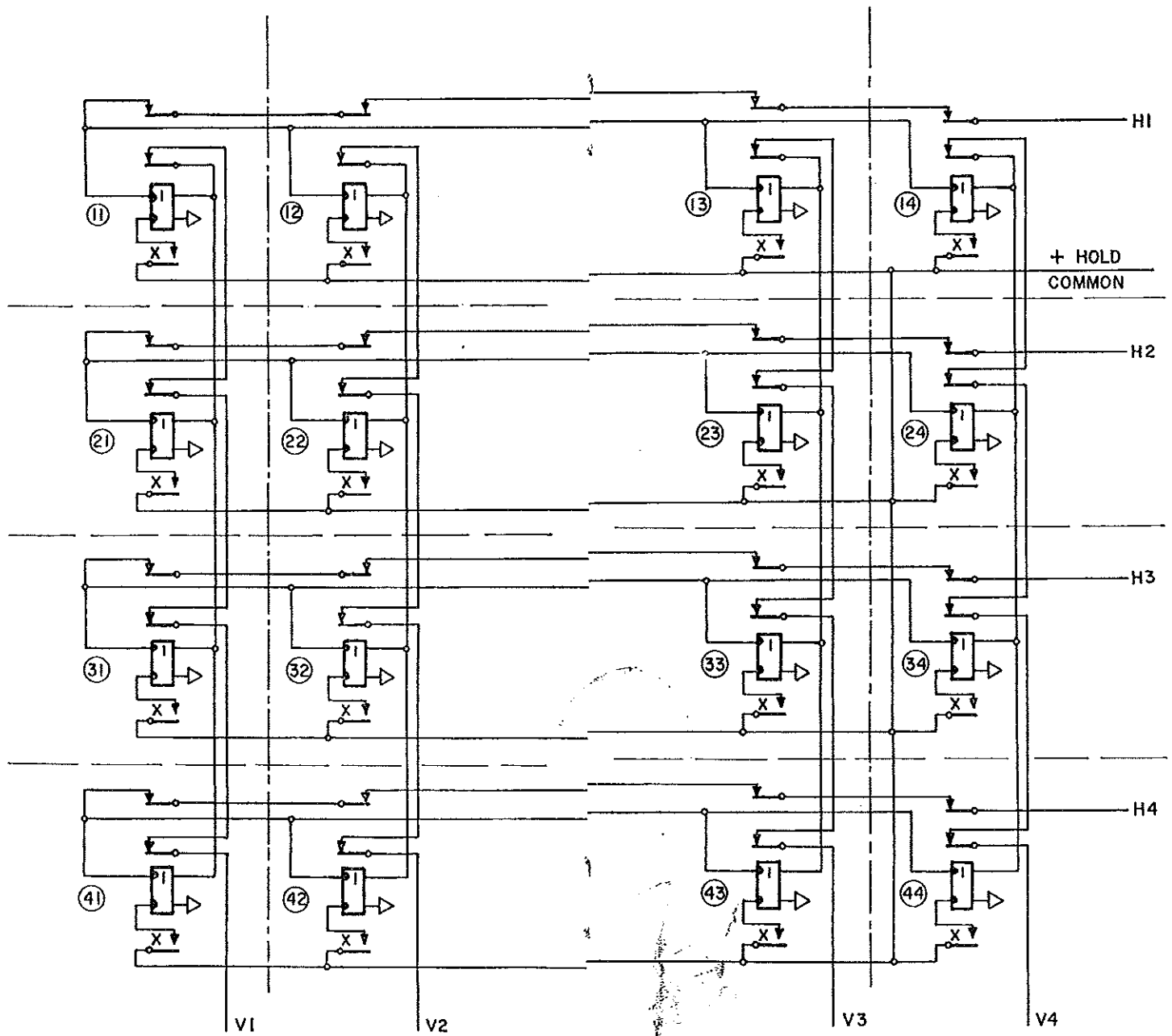


Fig. 18. Relay matrix, 4 x 4 full cross program.

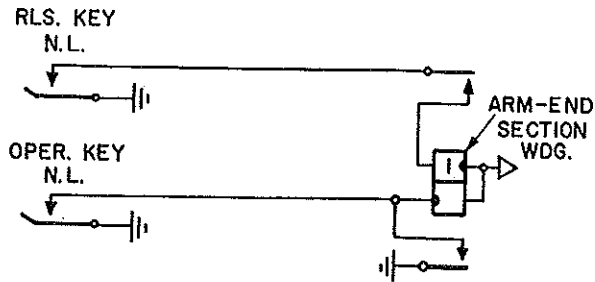


Fig. 19. Usual method of operating, holding and releasing double-wound relay.

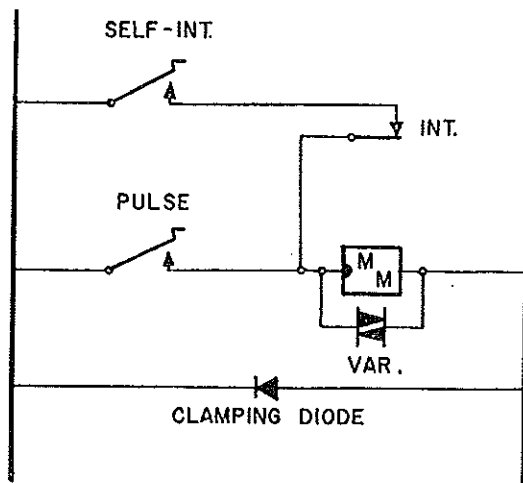
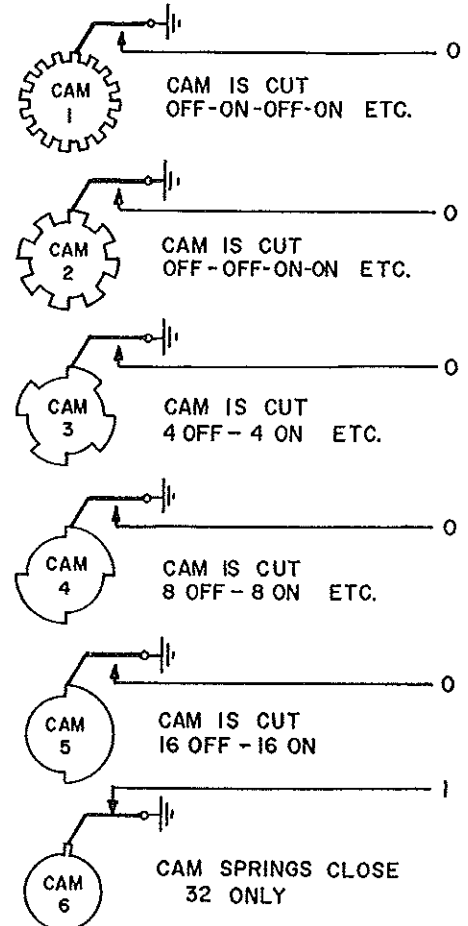
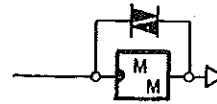


Fig. 20. Rotary stepping switch circuit with diode for reduction of electrical noise.



NOTE: This is a schematic presentation for simplicity. Cams may be rearranged for proper load distribution.

Fig. 21. AE's 32-point OCS Relay used as a binary readout. (Shown in position 32).

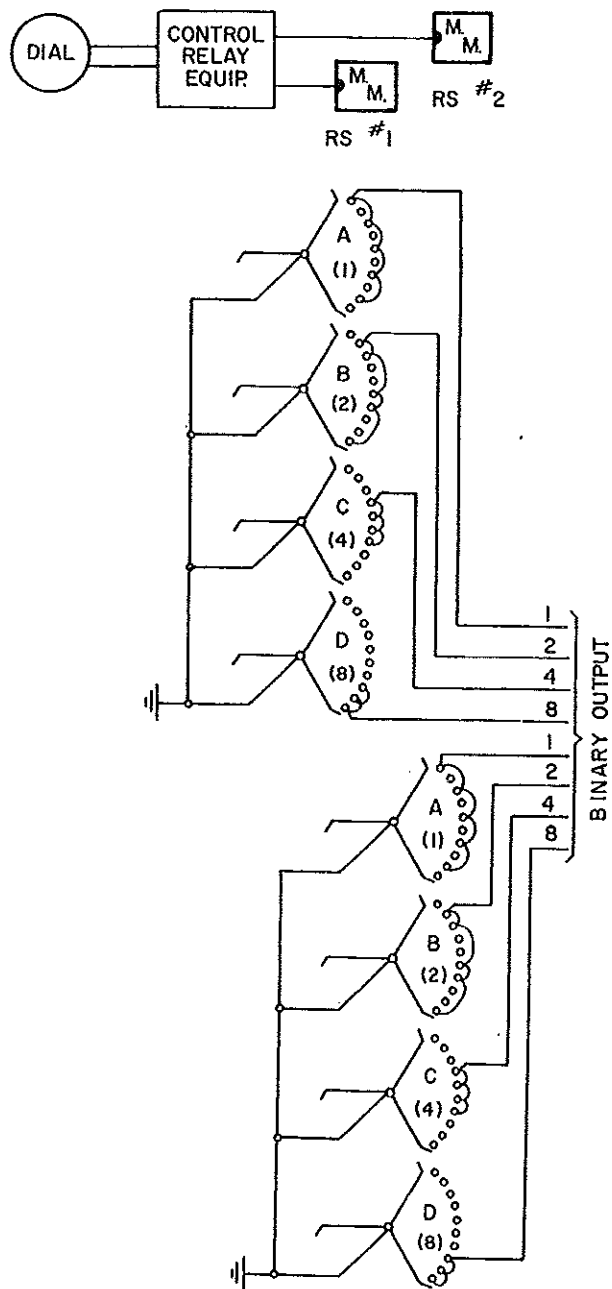


Fig. 22. Decimal-to-binary conversion.

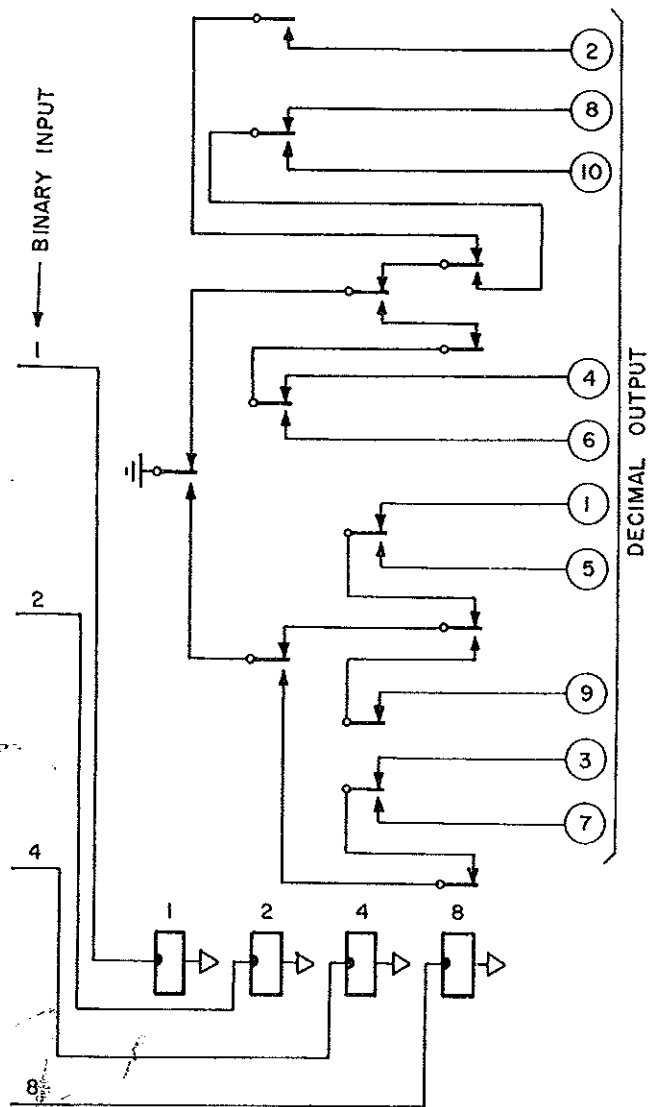


Fig. 23. Binary-to-decimal conversion.

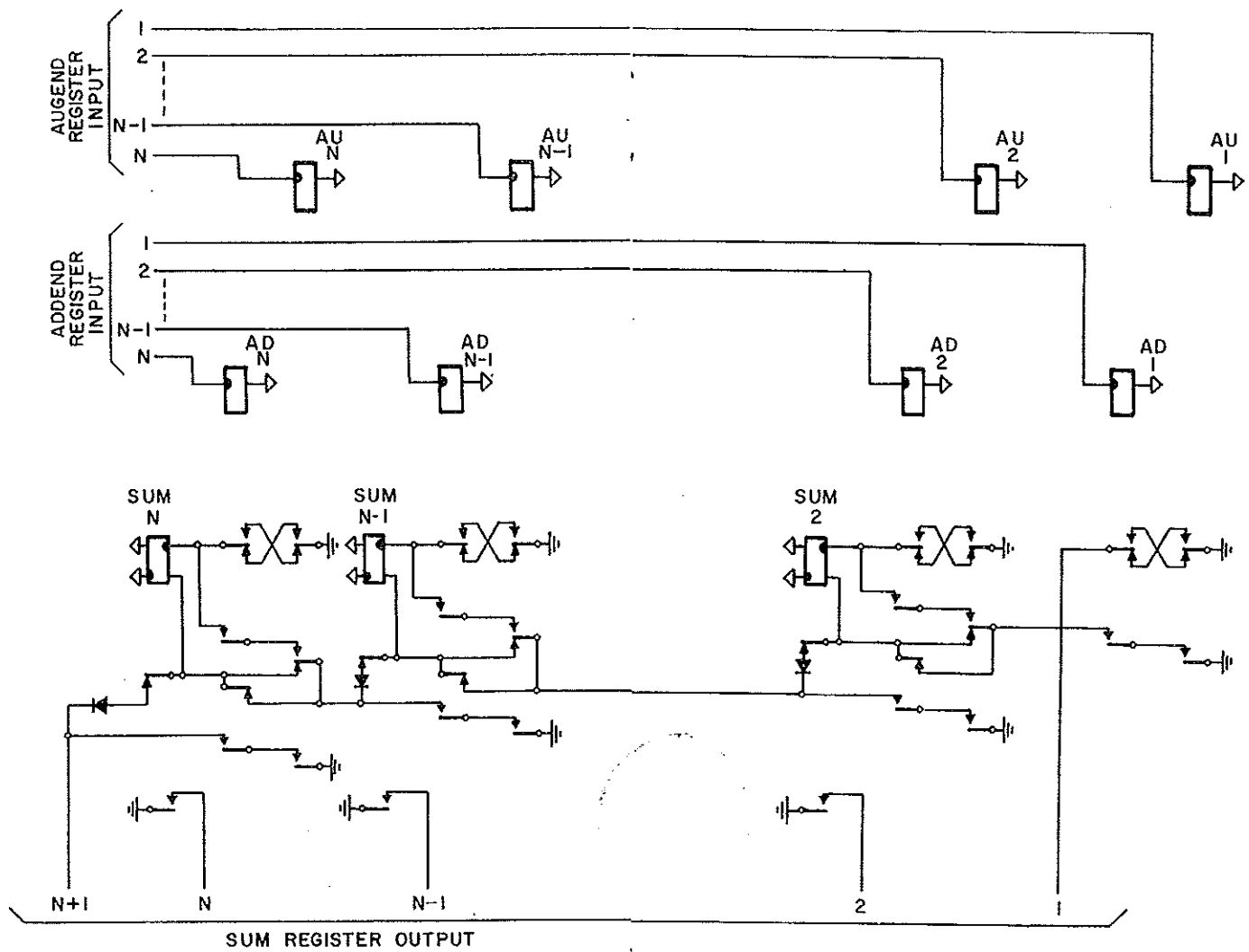


Fig. 24. Addition of numbers in binary form.

"IN" CARRY	AUGEND	ADDEND	SUM	"OUT" CARRY
NO	0	0	0	NO
NO	1	0	1	NO
NO	0	1	1	NO
NO	1	1	(1) 0	YES
YES	0	0	1	NO
YES	1	0	(1) 0	YES
YES	0	1	(1) 0	YES
YES	1	1	(1) 1	YES



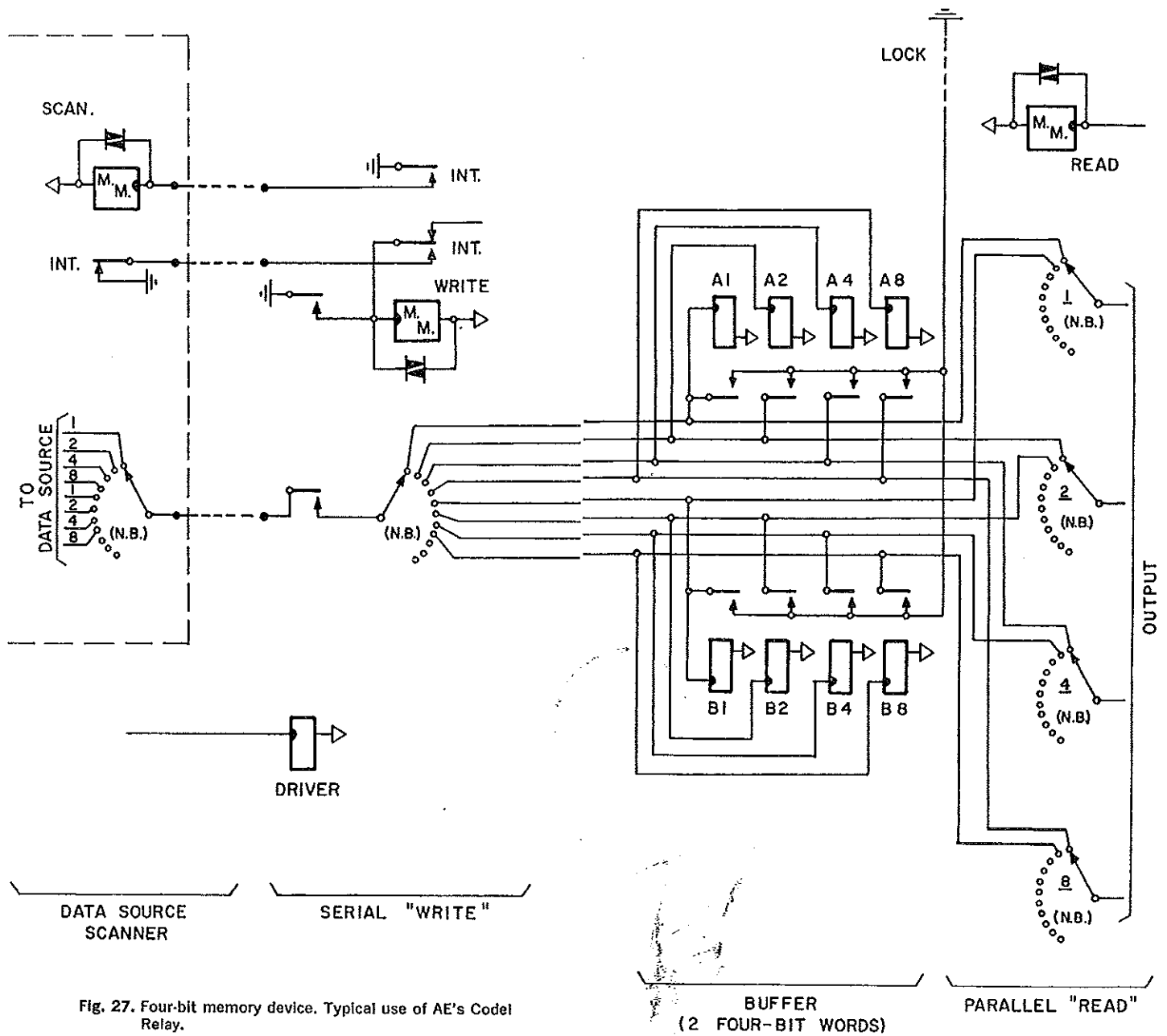
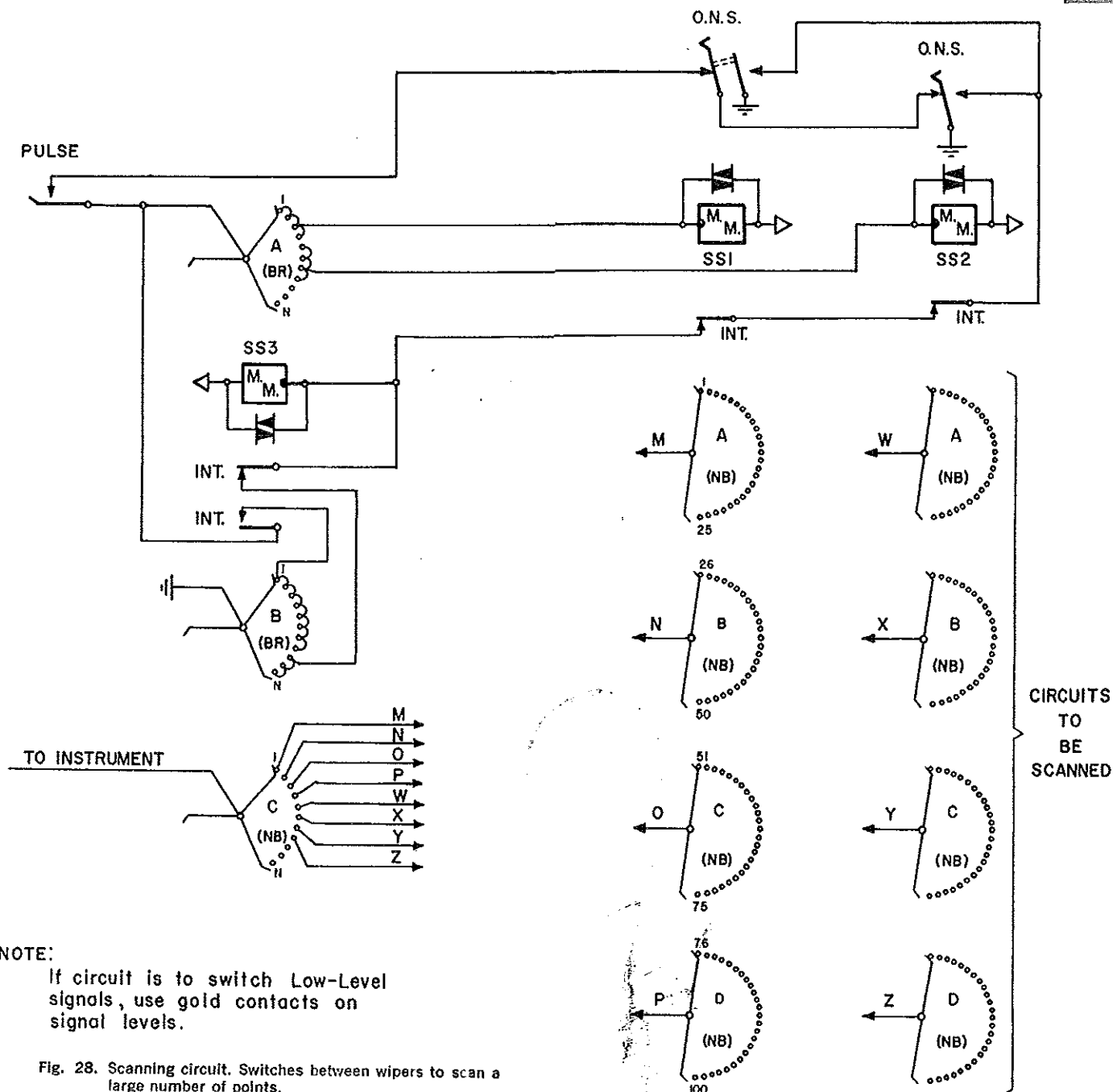


Fig. 27. Four-bit memory device. Typical use of AE's Codel Relay.





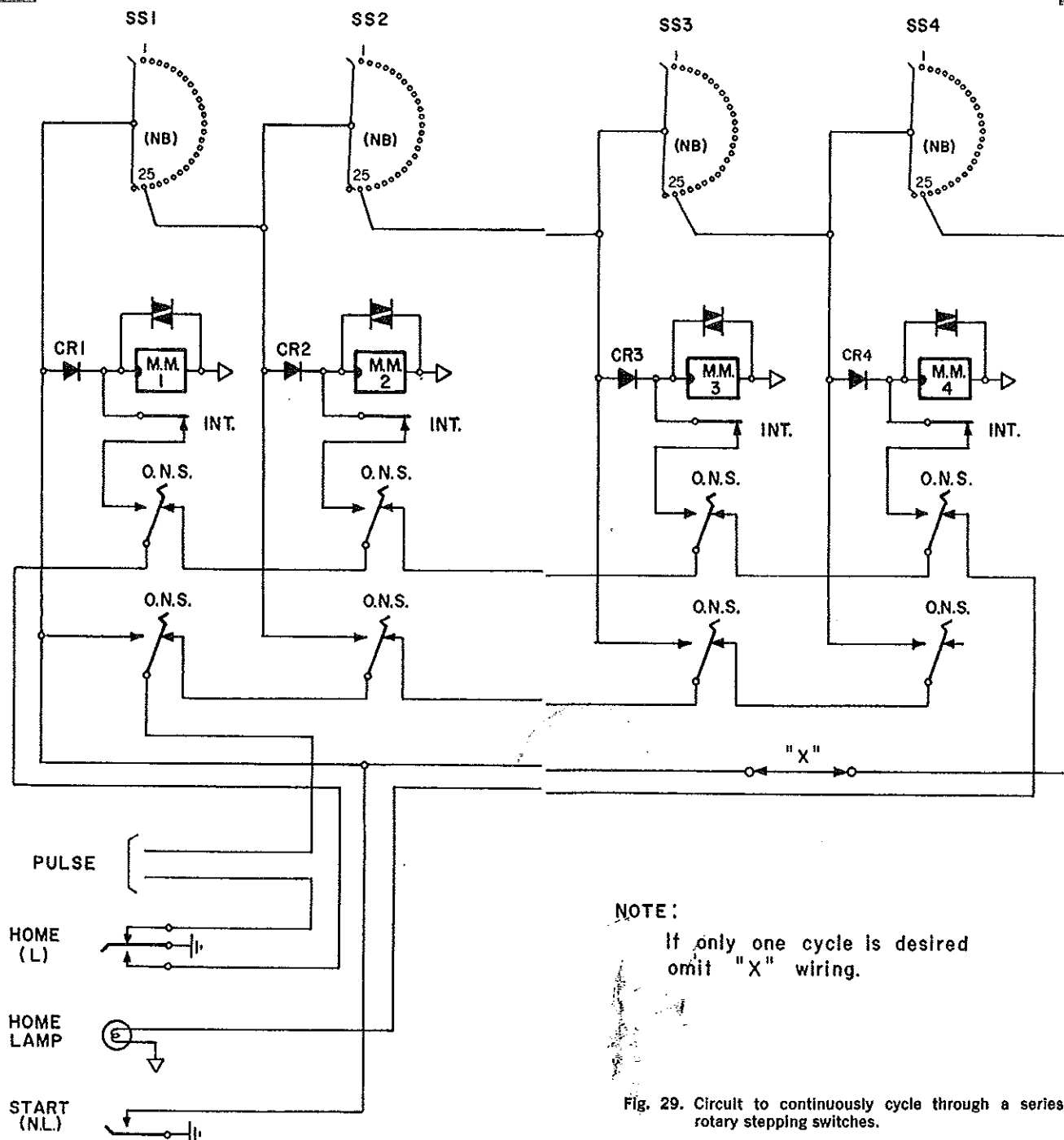


Fig. 29. Circuit to continuously cycle through a series of rotary stepping switches.

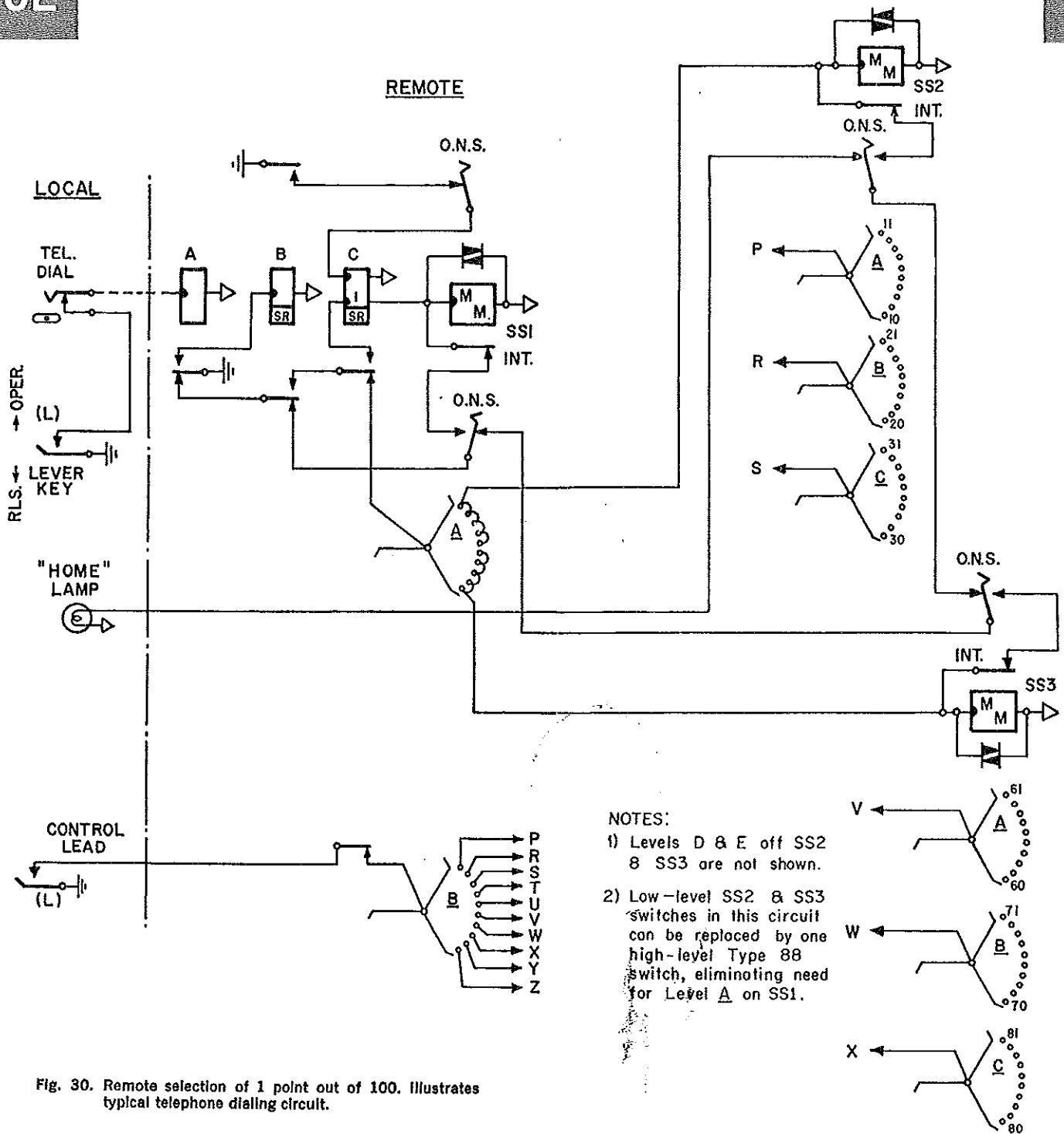


Fig. 30. Remote selection of 1 point out of 100. Illustrates typical telephone dialing circuit.

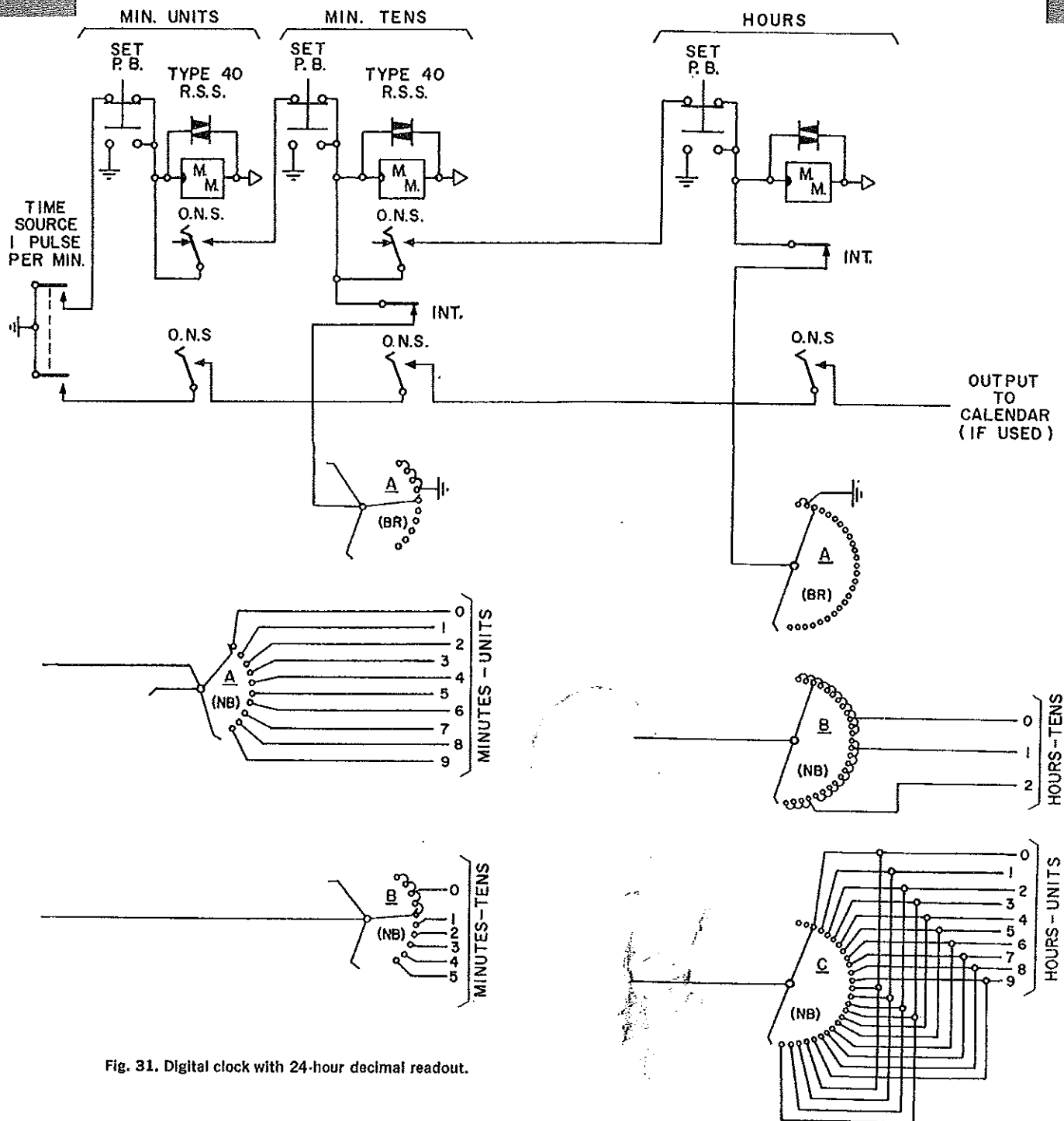


Fig. 31. Digital clock with 24-hour decimal readout.

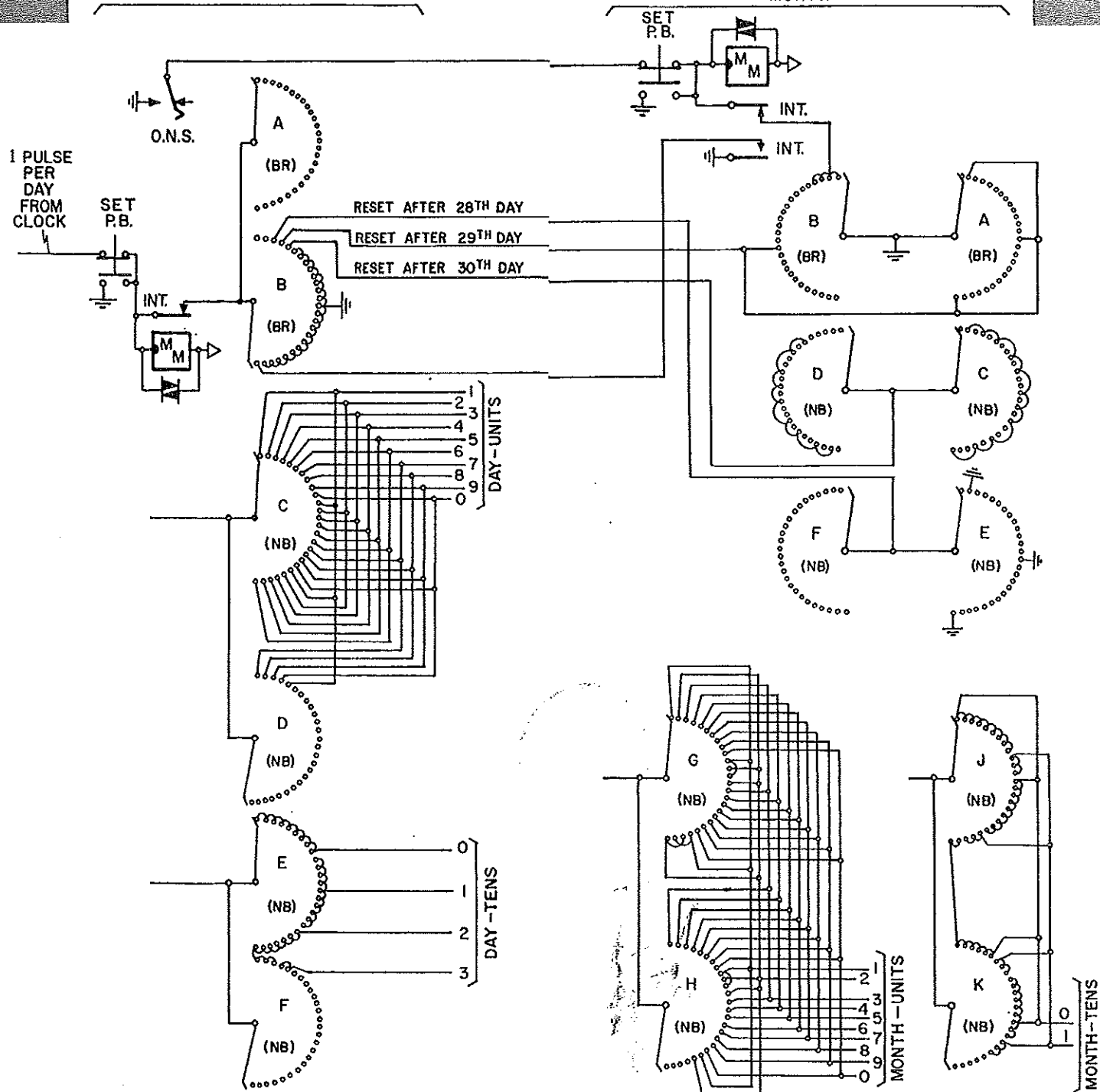
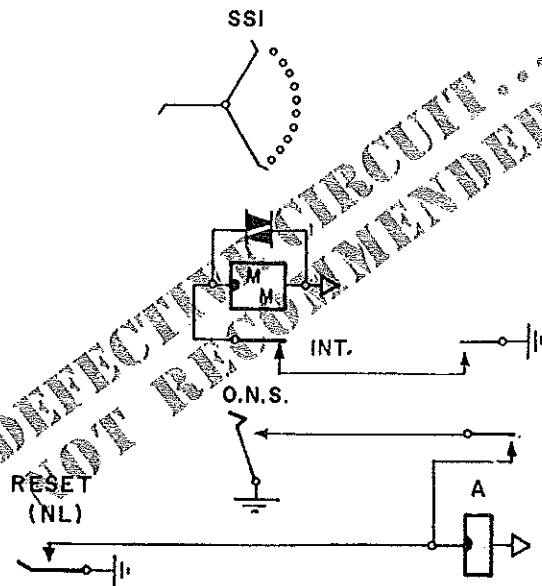
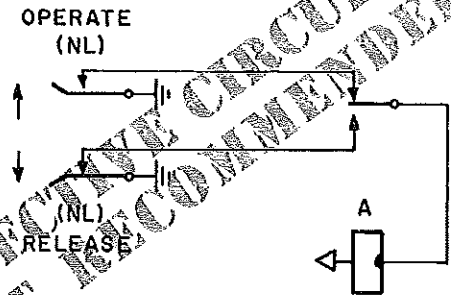


Fig. 32. Digital calendar, with 48-month cycle and decimal readout.



**Fig. 33. Trap #1. Stopping a self-interrupted rotary stepping switch by releasing a relay.**



**Fig. 35. Trap #3. Switching a relay's coil circuit with a Form C contact.**

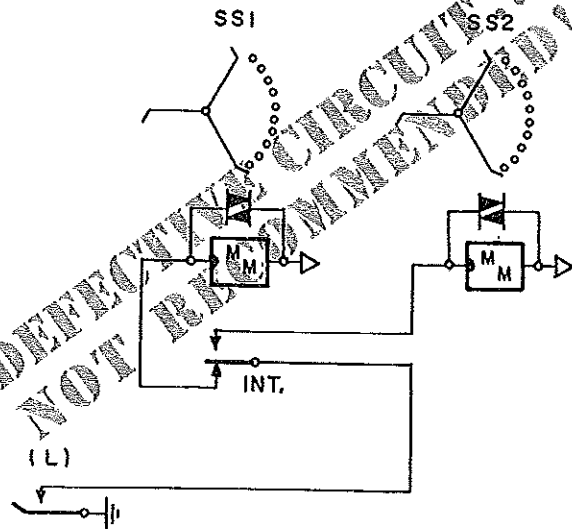


Fig. 34. Trap #2. Synchronizing self-interrupted rotary stepping switches.

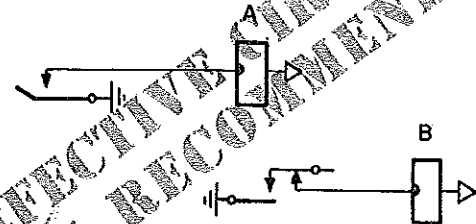


Fig. 36. Trap #4. Operating a relay with a pulse from a Form D.

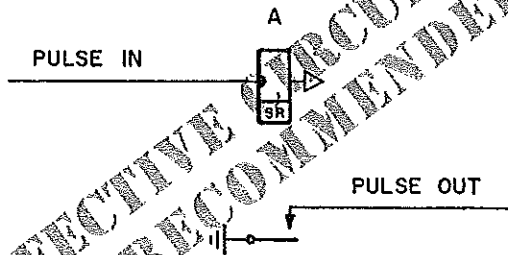


Fig. 37. Trap #5. Pulse-stretching with one relay.

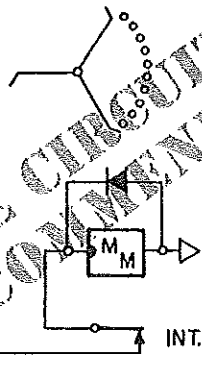
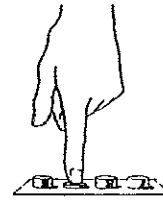


Fig. 38. Trap #6. Use of a diode as a spark-suppressor on a self interrupted rotary stepping switch.

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